DOCUMENT RESUME

ED 197 200 CE 027 847

AUTHOR Waters, Max L., Ed.
TITLE The Office of the Future--Implications for Change in Education. Position Papers: Annual Business Education Invitational Forum (4th, Provo, Utah, 1977). Research and Service Project Number 4.
INSTITUTION Delta Pi Epsilon, Provo, Utah.
PUB DATE 77
NOTE 83p.

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS *Automation; Business Education; *Computers; *Futures (of Society); Information Processing; Job Skills; *Microfilm; Office Machines; *Offices (Facilities); Online Systems; Position Papers; *Telecommunications; Vocational Education
IDENTIFIERS Word Processing

ABSTRACT

This publication contains six position papers presented by guest businessmen during the fourth annual Business Education Invitational Forum on the topic of implications of current change and technology in the environment in the office of the future. The article, The Office in the 1970's, describes the office as it is and as it is evolving, defines major problems encountered, indicates tested solutions to these problems, and suggests possibilities for further research. From a User's Viewpoint--What is Needed in Today's Office? looks at three basic positions on what is needed in today's office: need to prepare for change before it is introduced, need to establish direction, and need to strengthen management of administrative support functions. Role of Telecommunications in the Office of the Future reviews a popular futuristic view of the office, discusses how it could evolve, and puts it into a more realistic perspective. The next two papers, The Role of Microfilm in the Office of the Future and The Role of Computerized Word Processing and Information Management in the Office of the Future, discuss the respective advantages. The Office of the Future--An Integrated System addresses the concepts of the automated office and integrated systems and these concerns: technology, human factors, indexing, privacy, and economic justification. Following these papers is an article giving lists of critical competencies for managers and office workers of the office of the future developed at the forum. (YLB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED197200

THE OFFICE OF THE FUTURE--IMPLICATIONS FOR CHANGE IN EDUCATION

Position Papers
1977 BUSINESS EDUCATION INVITATIONAL FORUM

Research and Service Project
Number 4

Delta Pi Epsilon

ALPHA OMEGA CHAPTER
Brigham Young University

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

Max L. Waters

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

THE OFFICE OF THE FUTURE--IMPLICATIONS FOR CHANGE IN EDUCATION

POSITION PAPERS
1977 BUSINESS EDUCATION INVITATIONAL FORUM

ALPHA-OMEGA Chapter
Research and Service Project Number 4

TABLE OF CONTENTS

	Page
Foreword	ii
Vitae	iii
THE OFFICE OF THE 1970'S --Harold T. Smith	1
FROM A USER'S VIEWPOINT--WHAT IS NEEDED IN TODAY'S OFFICE? --Darwin A. John	24
THE ROLE OF TELECOMMUNICATIONS IN THE OFFICE OF THE FUTURE --Philip S. Pilibosian	32
THE ROLE OF MICROFILM IN THE OFFICE OF THE FUTURE --Donald W. McArthur	40
THE ROLE OF COMPUTERIZED WORD PROCESSING AND INFORMATION MANAGEMENT IN THE OFFICE OF THE FUTURE --James L. Ward	49
THE OFFICE OF THE FUTURE--AN INTEGRATED SYSTEM? --Lawrence R. Rojahn	60
OFFICE OF THE FUTURE: CRITICAL COMPETENCIES --William H. Baker --Harold T. Smith --Max L. Waters	71

FOREWORD

This publication includes the position papers presented by guest businessmen during the fourth annual Business Education Invitational Forum. This year's topic was selected because of the interest in the implications of current change and technology in the environment in the office of the future.

Sincere appreciation is expressed to the Forum speakers for releasing their position papers for publication. The Alpha-Omega Chapter of Delta Pi Epsilon publishes these papers annually as a service to the profession and to interested businessmen throughout the country.

The content of the papers included in this project may provide guidance in preparing instructional programs for workers who will take their places in offices of the future and also assist those managing future offices.

As co-host with the Business Education Department, Alpha-Omega Chapter hopes you gain much of professional values both for yourself and those you direct from the 1977 Forum.

Max L. Waters
Editor

VITAE

1977 FORUM PARTICIPANTS

DARWIN A. JOHN

Mr. John is presently director of Systems Development at General Mills, Inc. He has been Project Manager for Honeywell, Inc., and has held numerous positions with Thiokol Chemical Corporation. Mr. John received both his B.S. and M.B.A. degree from Utah State University. He has been a guest lecturer at graduate schools of Stanford University and University of Minnesota. He has presented papers on ADP Productivity to The Society of Management Information System and for the Diebold Research Group's Program.

DONALD W. MCARTHUR

Mr. McArthur is currently vice president of the Microfilm Products Division of 3M Company. He has served as president of the National Microfilm association and the International Micrographics Congress. Mr. McArthur has also been chairman of the advisory to the president committee of the latter organization. He has obtained mechanical and electrical engineering degrees at ICS. Mr. McArthur is a member of several of St. Paul's social groups.

PHILIP S. PILIBOSIAN

Mr. Pilibosian heads the marketing department of American Telephone and Telegraph Company at Morristown, New Jersey. Prior to joining the Bell System, Mr. Pilibosian was the market manager for Digital Equipment Corporation. He has had extensive sales and systems experience in the computer communications field based on past associations with IBM and Western Union. He has taught data processing courses in Systems Design and Analysis at Northeastern University and has been a guest speaker for

the American Management Association. Mr. Pilibosian received a B.S.E.E. degree from Worcester Polytechnic Institute and an M.B.A. degree from Clark University.

LAWRENCE R. ROJAHN

Mr. Rojahn is serving as senior industrial economist of the electronic industries department at Stanford Research Institute. He has specialized professional competence in telecommunications, corporate strategic planning, market/product research and evaluation, and voice and data communication systems analysis and design. He has been vice president of research and development of Superior Continental Corporation and manager of corporate planning for Continental Telephone Corporation. Mr. Rojahn has received an S.B. degree in electrical engineering from MIT and has completed graduate study in nuclear engineering and operations research and systems engineering. He was a National Merit Scholar. Mr. Rojahn is a member of the National Institute of Electrical and Electronics Engineers.

HAROLD T. SMITH

Dr. Smith is an Associate Professor of Business Education at Brigham Young University. He has served as office of the future consultant for General Mills, Inc. Dr. Smith has authored administrative management and office of the future articles. He holds a C.A.M. certificate and is president of the Salt Lake City Chapter of the Administrative Management Society.

JAMES L. WARD

Mr. Ward is a district marketing manager for IBM. He has held such positions as manager of the Managers Operations School at Dallas and branch manager at Spokane and Columbia, South Carolina. Mr. Ward has been presented the National OP Branch Manager of the Year and the District Manager of the Year awards. He has a B.A. degree and has developed the Managers Operation School for the OP Division.

THE OFFICE IN THE 1970'S

Dr. Harold T. Smith, C.A.M.
Associate Professor of Business Education
Brigham Young University

The purposes of this article are (1) to describe the office as we presently know it and as it is currently evolving in leading-edge organizations, (2) to define major problems encountered in the office of the seventies, (3) to point out solutions to these problems which have been tested, and (4) to suggest possibilities for further research. In addition, this article will provide background for the other articles in this issue which are devoted to the office of the future.

The Typical Office Today

The word "office" means many things to different people depending upon their experience. For example, to a doctor or a lawyer the office is a location for professional activity. To an elementary student the office is a place where he/she goes when he/she is naughty. To a factory worker, the office is place that is quiet and free from manual labor. To a clerk the office is a place of hard work and maybe boredom. To a top executive the office may be just a source of added expense or it may be an important source for obtaining vital information.

For purposes of our discussion let us define the office as a place where administrative-type activity and the processing of information take place. Examples of offices include:

- Reception and administrative area in dentists' offices
- Purchasing department offices in a large corporation
- Computer room
- Supervisor's work station in a factory
- Newsroom of a TV station
- A federal government agency's local branch office

To describe the typical office of the 1970's, let's look at the office from three viewpoints (1) technology, (2) people and organization, and (3) environment.

Technology

From the standpoint of technology, the typical office of today can be symbolized by the electric typewriter. Probably you will find a young lady seated at a desk typing a letter, form, memo, or report in this office. A file cabinet will be located nearby and not too far away you will find a copy machine. More than likely the organization will have a computer or at least have access to one. In the office you will find an assortment of other machines such as a postage meter, a dictation and transcription machine, a telephone, and possibly a microfilm reader, and many other pieces of office equipment.

Office technology, except for the computer, has been fairly slow to evolve until recently. During the 100-year period following the Civil War the office remained relatively static. During the period of 1970 to 1977 there was as much change in the office as there was during the previous 100-year period. During the next three years there is likely to be as much change as there was during each of the previous two periods.

So far most of this technological change has been introduced on a piecemeal basis rather than on an integrated systems approach. Each item of equipment has been designed to perform a specific function. For example, if a clerk is to send out a newsletter, the following steps and items of equipment are involved:

Step	Equipment
Type newsletter	Typewriter
Duplicate copies	Duplicator or copy machine
Type labels	Typewriter

Fold newsletters	Folding machine
Affix labels and insert newsletter in envelope	Mailing machine
Affix postage	Postage meter
Sort by Zip code	Manual or mail sorter
Bag mail and send out	Manual

One reason why technological development has taken place on a piecemeal basis is that manufacturers have been pretty much in command of technological development. Each manufacturer that has been specialized in one or two areas of office equipment has moved ahead on its own to develop equipment for which it could build a market. In other words, some technology would be developed, and then users and others would be called upon to find a way to use it. Several notable exceptions to this approach do exist. For example, some of the giant companies such as IBM, Xerox, and AT&T which market products over a wide spectrum, use a total systems approach.

To date, users, particularly smaller ones, have not had much impact on the process of developing new office technology. Need should be the basis for technological development. If users have particular problems, those needs should be a signal to manufacturers that specific products should be developed. For example, an organization may have a problem of maximizing the productivity of its executives. Perhaps they spend too much time in handling routine correspondence and in attending meetings. Rather than providing better dictation equipment and automated calendars, the manufacturers may be concentrating on improving the keyboarding of data and the output of high speed printers. While we are woefully behind in an area such as improving executive productivity, our technology is far advanced in other areas. In fact, technology generally tends to run far in advance of our ability to apply it in specific applications.

Word processing has succeeded where data processing has failed to meet the real informational needs of executives. The reason for the success of word processing has been because administrative managers and secretaries who have carried word processing, have been closer to the executive and are able to speak his or her language. On the other hand, data processing has largely remained a mystery to the executive and has been something imposed on him or her by unknown technical people in the computer world who speak their own unique language. Another reason for the rapid success of word processing is that it has built on the experience of data processing.

While much of office technology has been introduced on a piecemeal basis, computers have brought some integration of information processing to the office. The computer has primarily been concerned with processing hard, quantitative data and high volume repetitive reports and documents such as shipping invoices, payrolls, inventories, and accounts receivable. Most of the administrative processing of soft, qualitative information which relates to opinions, feelings, and judgments has been largely ignored to date by systems and computer people.

People and Organization--Next let's look at the office from the standpoint of people and the organization. Most of the workers in the office tend to be women clerical workers such as secretaries, clerks, typists, and receptionists. According to the Women's Bureau of the U.S. Department of Labor, about 79 percent of all clerical workers in the United States in 1975 were women. On the other hand most executives and managers tend to be male. Traditionally, we find a boss-secretary relationship in the office. The secretary tends to tie her promotional aspirations to the success of her boss and in return gives him her total loyalty and support. The boss tends to rely on his secretary to perform

many odd jobs for him in addition to routine paperwork processing. As a result, the secretary tends to perform many unrelated duties of various types in addition to performing typing and shorthand activities. The major reason for the existence of the secretary is to help her boss be more effective.

Helping the executive and his or her organization become more effective must be the primary objective of our concern in looking at the office of the future. But, how does the executive view his own effectiveness? Top executives tend to perceive of themselves as long-range planners, decision makers, and policy makers. Henry Mintzerb of McGill University in his research of top executives found that executives tend to be "firefighters" who are embroiled in daily operations. Many of their duties tend to be ceremonial in nature. Thus we see a discrepancy between the executives' self-perception and reality.

During the decade of the 1970's word processing brought with it the concept of specialization of secretaries. This concept will be discussed in more depth under the "Solutions" section of this paper.

From time to time we see varying degrees of support for "doing something about increasing productivity of clerical operations." Executives tend to become quite concerned during a period of economic recession with clerical productivity. Otherwise they tend to show little concern. Office equipment manufacturers state that their sales increase during a period of recession. In order to reduce the large cost of clerical salaries, managers invest money in office capital equipment in order to automate operations.

What is needed is a strong leadership on the part of administrative management or other qualified executives to manage administrative support and information processing functions in support of management.

These leaders will serve as catalysts in moving us toward the office of the future.

Office Environment

We have looked at office technology, and at the people and the office organization. Let's consider next the physical environment of the office.

In the typical office of today, executives have private offices with secretaries stationed nearby in an office or alcove. For clerical workers or technical personnel, depending upon their status in the organization, private offices, partitioned work areas, or large open areas of office space are provided. In the past the office has been characterized by large areas with straight rows of desks. The office has tended to be a very sterile environment that was cluttered with paper and polluted with noise. In many respects the office environment has been dysfunctional. Office workers having a need to communicate may not be able to confer with people who have needed information or decision-making authority. At other times unnecessary chitchat about inconsequential matters becomes distracting.

Also, the office has been quite inflexible in adjusting to change. As the organization and its operations change, the office has not been able to adjust quickly and inexpensively. Fixed walls, partitions, and utility outlets do not lend themselves readily to change.

Problems

Many problems have been encountered in the office. Six of the more important ones will be discussed: (1) high cost, (2) low productivity, (3) poor communication, (4) inadequate time availability, (5) inavailability of information, and (6) employee dissatisfaction. All of these

problems as they interfere with the primary mission of the office--to provide information and administrative support to management--result in lower effectiveness of managers. Ultimately the goal for the office of the future is to make the executive and his or her organization more effective.

High Cost

First, the cost of operating the office will be discussed. According to Paul A. Strassmann, Xerox's staff director of administration and information systems, $418 billion was spent during 1973 for information processing in the United States. About $26 billion or 6 percent of this total was spent on data processing. Approximately $42 billion or 10 percent went for administrative processing (office equipment). A staggering $350 billion was spent on office personnel salaries and associated overhead expenses. Alan Purchase, senior industrial economist at Stanford Research Institute, reported in the June 30, 1975, issue of Business Week that office costs are accounting for 40 to 50 percent of all costs. One major corporation estimates that it spends $40 million annually on clerical expenses in its headquarters operation.

One substantiating statistic is the rising cost of the average dictated letter. Dartnell Institute of Business Research started determining this cost back in 1930 when it was estimated to be 29.6. In 1977 this cost has jumped to $4.47. Another statistic is the increase in overall administrative and clerical time costs. According to the Bureau of Labor Statistics of U.S. Department of Labor, these costs rose by 53 percent from 1960 to 1971.

While these clerical costs are high they don't consider one of the major areas of administrative costs. Each manager and technical person

spends a major portion of his or her time performing routine administrative type activities. For example, a manager may need a copy of a document made while his or her secretary is away from the office. The executive walks to the copy machine and makes a copy. Because of the high cost of an executive's salary, the cost of the copy suddenly becomes very expensive. If the executive earns $400 per week and spends 8 minutes to make the copy, his or her time alone will amount to more than $1.50.

Another example will readily show how expensive having managers and technicians perform routine administrative work can be. If an organization has 100 persons averaging $20,000 each for salary and fringe benefits, the annual cost will be $2 million. If 20 percent of their time is spent in routine clerical activity, the cost will be $400,000 per year. That is pretty expensive clerical work.

If clerical work is so expensive, why don't managers do something about it? Traditionally executives have concentrated their cost reduction efforts on production and sales functions. Some attention may be given to the cost of paper clips or pencils or other administrative costs. A few executives are caught in the trap of controlling pennies and neglecting to control the dollars. In other words, they place tight controls on office supplies and neglect to control salaries which constitute about 70 percent of office costs.

In the factory and on the farm, large investments in capital equipment have been made to reduce expenditures for manhours. This investment rate has not kept pace in the office. The average investment for each factory worker is $24,000 and $35,000 for each farm worker. A clerical worker is backed by an investment in capital equipment of only $2,000.

Administrative costs have not been controlled very well because they are difficult to isolate and because top management has not seemed to realize the impact of administrative costs on the total profit picture of an organization. Consider the following example to see the importance of administrative costs on the profit picture. A company earning 6 percent net profit on gross sales of $10 million would earn $600,000 profit in a year. One hundred office employees averaging $6,000 salary per year would earn $600,000. Cutting the staff by ten employees would have the same impact on profits as increasing sales by $1,000,000.

Low Productivity

Low productivity, the second office problem to be discussed, is normally associated with high costs. For some organizations the name of the game is increasing productivity or in other words getting more production or results with the same number or fewer people. Mr. Strassmann points out that while direct labor as a percentage of the total U.S. labor force decreased during the period 1950 to 1970 by 9 percent, the overhead category into which clerical personnel fall was increasing rather than remaining stable or declining. According to the Stanford Research Institute, during the period 1960 to 1970, "production worker productivity rose 83 percent while white collar productivity increased a mere 4 percent.

Informal observation usually confirms these statistices. If you walk into any office, you are likely to find a large percentage of the employees idle, informally engaging in small talk, or in some other way wasting time. The other day a new employee in the office of a large corporation was having coffee with one of the veteran employees. The new employee asked, "How many people do you have working here?" The

veteran replied, "Oh, about half." Unfortunately, that statement may be more fact than jest. One more example will help to illustrate the dramatic decline in productivity being experienced in this country. The Empire State Building, which was completed in 1931, required one year and ninety-eight days to complete. An expert in building construction estimated that if that same structure were to be built today, three to three-and-a-half years would be required to do the job.

The productivity of office workers can be measured directly fairly easily. The number of lines typed or the number of letters filed can be easily counted. But measuring the impact of a lack of administrative productivity on managers and on the total organization is difficult. How do you measure the effect of missing or inaccurate reports on a manager's productivity when he or she is trying to make a decision?

Poor Communication

The third major office problem is poor communication. The research of Henry Mintzberg from McGill University and others suggest that managers spend approximately 75 to 80 percent of their time communicating. Communication is at the heart of a manager's job. Poor communication seems to be the source of most problems, and effective communication appears to be the answer to most problems.

Considering how important effective communication is to a manager, it is humbling to realize what a poor job many managers do with communicating. How much difficulty is encountered in just getting a message through to the receiver! For every phone call that is completed, several will not be completed because no one answers the phone, the line is busy, or the number is wrong or changed. If you are sending a message by the U.S. mails, you may encounter long delays before delivery is made.

Even if the message is delivered there is no guarantee that it will be understood. The idea in the mind of the receiver may be quite different from the idea that was conceived in the mind of the sender. For example, if a manager asks a systems analyst to develop a specific report with certain specifications, the idea of the report communicated to the systems analyst may be quite different from the report that the manager had in mind.

This example touches on a critical office problem. Systems computer personnel and other technical persons tend to speak their own language. They use jargon that is virtually unintelligible to the average manager. Here are some typical words used by computer personnel to describe word processing capabilities:

Automatic logging

Automatic re-pagination

Global search/substitution

Forward and backward scrolling

Optional asynchronous communication

In addition, some technical people have conveyed a rather arbitrary attitude to users about solutions to problems. The technicians convey the impression to users that as technical people they have all the answers and the user can take them or leave them. Some users have tended to rebel and in turn have given the technical people a difficult time. The technicians, on the other hand, suggest that the users are inarticulate in expressing their needs. Clearly there is need for users to be more familiar with their needs and to be able to express them as well as background information in clear, precise terms. On the other side, technicians have an obligation to eliminate the jargon and speak in common terms according to the understanding of the person receiving

the communication. Managers should take advantage of the services of systems persons who have time and technical knowledge available to help solve problems.

Another dimension of this communication problem is the person-machine interface. More frequently people and computers are communicating directly with each other via terminals and oral interface units. People become very frustrated when they are not able to make the computer understand a problem such as their need to get an answer as to why they have been billed twice for the same purchase or some similar problem. Also the computer is blamed at times for the mistakes and inadequacies of people.

Some of the more difficult communication problems in the office relate to the feelings of people. Communicating some hard data about sales or goods shipped is one thing. Explaining to a secretary why her performance has been unsatisfactory and why she needs to change her attitude is quite another problem. Conveying feedback about work performance and needed personal improvements is particularly difficult. Managers find that the generation gap is a real thing when they try to communicate with young office employees who have completely different sets of values and frames of reference.

Another phase of the office communication problem is the timely supplying of needed information for decision-making purposes. Elaborate management information systems (MIS) have been developed to help make decisions more effectively. In reality, as Mintzberg points out, managers do not use these data banks of "hard data" but rather rely on "soft information" such as gossip, hearsay, speculation, and opinion. Mintzberg says, "Every bit of evidence suggests that the manager identifies decision situations and builds models not with the aggregated abstractions an MIS

provides, but with specific tidbits of data." Because the manager has a position of status and formal authority, he or she is constantly receiving this soft information. The information is received orally primarily and processed in the brain of the executive where it is stored for further use. Most of the vital information used in making key decisions is stored in the brain of the executive, not in the memory of a computer. Although the executive tries to share as much of this information as possible with his or her subordinates so that they can intelligently help to make decisions, frequently the information does not get through.

Inadequate Time Availability

A fourth major office problem is time availability, particularly for executives. Almost all persons, particularly managers, suffer from not having enough time to do everything they would like to do. Not only does the time seem to be inadequate, most people have a major portion of their lives completely programmed by other people. These other persons each have their own areas of interest. Meanwhile the executive finds very little unscheduled time to spend on his or her own high priority activities. Mintzberg says that managers seem to jump from one thing to another, responding to the pressure of the moment. Half of the activities engaged in by the chief executives that were studied by Mintzberg lasted less than nine minutes and only 10 percent exceeded one hour. They don't have any pattern in the way they schedule their time. Their time is virtually being controlled by their subordinates and others.

Frequently managers are admonished to delegate as much as possible to other people. This is good advice, but the problem lies in the fact that managers have much of the vital information for decision making stored in their heads. They find that it is easier to take the action

themselves than to communicate the information that would be necessary to make decisions. Thus managers find themselves caught in a trap from which they cannot escape. Consequently, they spread themselves thin and are less effective than they might otherwise be.

Managers and others are advised to set priorities and to do the most important activities first. Generally the Pareto principle, which was named after Vilfredo Pareto, an Italian economist and sociologist of the nineteenth century, applies. This principle suggests that 80 percent of the contribution toward results is derived from only about 20 percent of the activity in which the person in engaged. On the other hand, about 80 percent of his or her activity only makes about a 20 percent contribution to the person's success. Therefore, managers are instructed to identify those critical activities that contribute most to their success and concentrate on those activities. Again the problem comes from the fact that the executives are so busy fighting fires that they don't have time to spend in this type of reflective planning.

Inavailability of Information

The fifth office problem is inavailability of information. With the expanding amount of information available today, many people have difficulty in finding data that are in their possession or in the organizational file or library. A manager may have what he or she needs in a desk drawer or office file, but not be able to locate a specific document when it is needed. Keep in mind that the major responsibility of the office is to provide needed information to the executive in a timely manner at a reasonable cost.

Four ways in which the office fails in this responsibility of providing adequate information to the manager are: (1) information must

be extracted from large amounts of extraneous data, (2) information is not in the required format, (3) information cannot be found, and (4) information has not been captured. The following four cases illustrate each of these problems:

Case 1. "Here is the information that you asked for. If you will just look through these four computer printouts you will find everything you need. Of course you may have to do a little digging. Where would you like me to put this stack of reports?"

Case 2. "You bet we can give you the data you need. There is one problem, however. The format is different. We will need about four weeks (two months is probably more realistic) to reprogram to get the report as you want it."

Case 3. "I am sorry, Ms. Schmidt. I can't locate that memo from Bruno Electric that you asked for. It must be in the files someplace. I'll keep looking. Are you sure that you don't have the memo on your desk?"

Case 4. "I really don't know the cost of preparing a letter on our new word processing system. We haven't been keeping that information. Would you want us to start keeping track of those costs?"

Employee Dissatisfaction

Finally, the area of people problems in the office is one that needs to be considered. Many office personnel are dissatisfied with their jobs. They are bored by the routine work. They don't feel challenged. They feel that what they are doing doesn't really matter. Also, and a very important concern, they feel that no one really appreciates them. Lost time, high absence rates, and high personnel turnover are the results.

Elaborate and expensive plans to improve office operations frequently end in failure when the people factor is not given adequate consideration. In fact, efforts to increase productivity and reduce costs have resulted in greater specialization for office employees and frequently have meant more feelings of dissatisfaction. Trends of greater specialization have been running counter to recent efforts to redesign jobs to provide greater job enrichment and thereby more job satisfaction.

Solutions

In this portion of the paper, solutions to the problems which have been previously discussed will be presented. These solutions will not be tied to specific problems because there has been wide interaction between the solutions and the problems. Seven solutions, some of which are very traditional and others which are more modern, will be presented: (1) additional people, (2) work simplification, (3) human relations, (4) job design, (5) reorganization, (6) mechanization and automation, and (7) office landscaping.

Additional People

The first possible solution is additional staffing. When workloads become heavy and more time and productive effort is needed, adding more people has been a favorite and easy answer to the problem. For example, if Mary and Edna can't get the filing done, hire and train a new person to help them get the job done.

The major difficulty with this solution is that adding new people can be a very costly method of solving the problem. Of course an adequate number of personnel should be hired to do the job. The problem comes when people are added indiscriminately without reviewing other solutions.

Another difficulty with adding more people is that supervisory and communication problems increase as the size of the office staff increases.

Work Simplification

A second solution is simplifying the work. An approach to solving the productivity and cost problems has been work simplification. This approach involves analyzing the work to find ways to make the work simpler and easier to perform. In reality work simplification has normally resulted in breaking office jobs down into simpler tasks and having one person specialize in a particular task. For example, in accomplishing the job of preparing a newsletter for mailing, the job could be broken down into four specific tasks: typing, duplicating, collating, and mailing. When several newsletters or similar documents are to be prepared for mailing, a person would be assigned to accomplish his or her specialized task for all such materials. As a result an employee might type or collate papers on a continuous basis. While specialization allows the employee to do the job faster, the work may become very boring and a problem of employee dissatisfaction may be created.

Human Relations

A third solution is to build better relationships with the office employees. Learn to understand them and communicate with them. Show appreciation and concern for their needs. This solution is an attempt to solve employee dissatisfaction problems. Increasing employee compensation and benefits is used commonly also as a means of increasing worker satisfaction.

Sincere efforts on the part of supervisors and managers to build better interpersonal relations with their employees usually pay rich

dividends. The difficulty comes when employees continue to do routine, boring, repetitive work. For example, some people, particularly those who are better educated and more intelligent, will be dissatisfied if they have to file and find documents day in and day out for month after month.

Job Design

The fourth solution, job design, is an approach to solve the dissatisfaction problems resulting from poorly engineered jobs. Job design, commonly known as job enrichment, is an effort to make work more meaningful. This approach grew out of the research on employee motivation accomplished by Fred Herzberg. Job enrichment means designing jobs that give employees greater responsibility by assigning them work formerly done by their supervisor or manager.

The theory is that workers who find greater challenge and responsibility in their work will be more highly motivated. A number of organizations have used job enrichment with great success. Professional literature is replete with accounts of successful applications of the job enrichment concept. The failures usually have been associated with problems of poor planning and communication. Because the approach is new, many organizations have simply not availed themselves of the opportunity of testing the approach.

Reorganization

A fifth solution to office problems has been reorganization. Traditionally secretaries have been assigned to executives on a one-on-one basis to form a team. The secretary-boss relationship has been a close one. The secretary types all correspondence and performs numerous tasks. The secretary is a jack-of-all-trades. When the concept of word

processing was introduced, specialization was brought to the job of secretary. Typing tasks were given to correspondence specialists who were organized into word processing centers under the direction of word processing supervisors. The other parts of the job were assigned to administrative support specialists. Under this system, the boss-secretary relationship was eliminated because support specialists, relieved of typing duties, could provide support for more than one manager or principal.

In practice this system has encountered problems in implementation because of resistance to change. Bosses are reluctant to give up their secretaries and are fearful that they will not be able to get their work done. Secretaries are also fearful that they won't like the new arrangement and that they will be cut off from their boss who has been a source of pay increases and promotions.

Once the word processing organization has been implemented, many organizations have been pleased with the results. Generally, there has been a feeling that more work can be accomplished at lower costs. On the other hand, some organizations have failed in using this approach. In some cases an attempt was made to establish a giant word processing center in one quick move. Poor planning was partially to blame. In retrospect, fault must be found with the concept itself. While large word processing centers have a place and fill a need, the problem lies in suggesting that they are the only answer.

Currently, a new concept, known as small work groups has been introduced. This approach places a small group of secretaries (two to six) near a group of managers or technical personnel who require administrative support. The secretaries specialize in either typing or administrative support activities and then trade off as necessary or desired.

this concept provides the advantages of specialization found in the large centralized word processing center as well as the advantages of the decentralized one-on-one concept.

To reality what is needed is a combination of these three approaches depending upon particular circumstances. For top executives and others who require much clerical support of a specialized nature, one or more secretaries may be assigned. For high volume, repetitive typing work, a large word processing center may be the answer. For the rest of the organization, perhaps the small work group concept may be the best answer.

Mechanization and Automation

Solution number six to office problems is mechanization and automation. Over the years a continuous flow of new office machines has been introduced starting with the typewriter which has remained over the years as the basic office machine. The purposes of office machines have been to speed up and to increase the capability for performing office tasks. These purposes have been achieved, but a proliferation of office machines has resulted.

One of the key characteristics of the automated office of the future is an integration of various office function into one system. Rather than move from one machine to another to perform various functions, the executives and office support personnel will be able to perform all functions from a terminal. How this will all come about and what the system will be like is the subject of the other articles in this series.

Office Landscaping

The seventh solution to office problems turns attention to the office environment and physical problems of the office. As was mentioned

previously, generally the office has been a rather sterile and dysfunctional place in which to work. The office has been characterized by private offices for managers and technical staff and by large, open areas with straight rows of desks for clerical personnel. Fixed walls have made change difficult and expensive. The "bull pen" atmosphere of the clerical area has been degrading and has hampered production. Also, expensive space has been wasted.

One solution to these problems has been the introduction of office landscaping and new types of office furnishings and panel-hung fixtures. Office landscaping places people together according to their need to communicate and work together. Walls are eliminated and replaced with panels to divide work stations and functional areas. Changes are easy to make and inexpensive. Facilities are provided to help make work easier and more pleasant.

Recommendations

In order to solve the office problems faced in the seventies and to make the manager and his or her organization more effective, the administrative manager will need to apply all of the solutions outlined in this article. So far, the right's share of attention has been given to automation and technology. While this technological development is important and necessary, the management and people side must not be neglected if a workable system is forthcoming. For a complete workable solution to implementing the office of the future, the following steps should be taken:

1. Carefully select and train new personnel who will be able to adapt to change and function smoothly in the office of the future.
2. Use systems analysis to develop effective, efficient systems.

3. Understand your own leadership style and apply principles of effective interpersonal relationship development.

4. Redesign jobs in accordance with job enrichment principles.

5. Apply organizational design for administrative support that is most appropriate for specific circumstances.

6. Become knowledgeable about automated office of the future systems as they are introduced and make the commitment to implement change.

7. Investigate feasibility of using office landscape concepts and new office furnishings in your office.

With all of the technology and management expertise that has been developed, one area has been neglected. More study is needed on how to provide more effective administrative support to the manager. What management duties can be delegated to support team members? How can the manager communicate more effectively with team members so that they will be better prepared to carry out delegated assignments? How can we get the manager to let go of routine tasks and do more delegating? Further research in this area is needed.

Summary

The office of the 1970's is starting to change in order to be responsive to the needs of executives for increased administrative support and for better information. In some leading-edge organizations, the office of the future is already with us. Many organizations, particularly small ones, are trailing far behind. Hopefully in five or ten years all organizations will have made substantial progress toward the automated office of the future.

FROM A USER'S VIEWPOINT --

WHAT IS NEEDED IN TODAY'S OFFICE?

Darwin A. John
Director of Systems Development
General Mills, Incorporated

Broad Environment

We have read, heard, and participated in many discussions about "The Office of the Future," "Office Automation", or "Administrative Support Future Directions"; but there have been no major implementation thrusts of automation in the administrative area.

The technology is still evolving but basically has been available for some time; however, it seems that only a select few have moved forward. Most movement in companies and organizations has come from individuals or single managers introducing change without any overall direction being established by their organization. They have backed into some enhancements.

Could it be a lack of preparation for this type of change?

We have all observed and been concerned with the lag between Technological change and Sociological change for a long time. There are some basic questions we ask ourselves which are difficult and sometimes conflicting.

- How do we prepare individuals and organizations to accept this new technology and the resulting change? There seems to be a great deal of time, effort, and resources applied to advancing the technology but very little time, effort, and resources applied directly to advancing our preparation to receive the technology.
- The second more urgent question is: how do we protect the individual as we introduce new technology? How do we keep him/her from becoming

an extension to a machine? In the past we have made some of these kinds of mistakes.

Where does motivation come from to move forward in office automation for these select few who have moved forward?

- Sociological--Some say that current moves in our society are bringing new awareness and much higher expectations for the employees who traditionally have worked in administrative support areas. Thus, change is required.
- Technological--It is here, why not use it?
- Organizational--One school of thought says the basic benefits of centralization and economies of scale can be important motivators.
- Economic--There are increasing productivity opportunities. There are opportunities to bring Cost Awareness to the administrative support areas and significantly reduce costs and enhance operations. But the reason why most organizations have not done much about office support costs is their low visibility: people and equipment physically dispersed individually or in small units throughout the organization, costs buried in vaguely described lower lines of many cost statements.

This lack of visibility has resulted in two major changes passing virtually unnoticed in their impact on the particular organizations: the strong upward explosion in people costs, paper processed and filed . . . compared to the strong downward reduction in costs possible through alternative new technologies and modes of organization.

In addition to low visibility there has been basic resistance to change. Why the resistance to change? We can probably classify it the same as we did for motivation. From the individual's or small organization's perspective:

. Sociological--Let's keep it the same as it is.

. Technological--Is not adequate reason to change.

. Organizational--Where will I come out?

. Economic--What are you going to do with the dollars we save?

From a user's viewpoint: what is needed in today's office?

The first basic position is we need to prepare for change before we try and introduce it.

It is possible that if the need for change is not recognized, an organization can be at a point where it is not capable of changing itself internally. A decision to change can set completely new objectives for an organization because one change can create a need for another change. We need to prepare for change.

The second basic position is we need direction established against which we can measure decisions as we move forward. The glaring example is the lack of Information Policy Statement. Information is Information is Information; or is it? It needs to be determined in each of our organizations.

My position is: we need to recognize that Administrative information is really no different than the information we have traditionally managed and to which we have applied technology in our Data Processing environments. We need to build on that expertise available in each of our organizations and not try to build from ground zero. This information policy position and direction needs to be defined.

The third basic position is that Administration has not been an attractive area for high potential management people. We need to strengthen management of Administrative support functions, first to manage the change process and second to capture and keep captured the resulting benefits.

An Approach to Change

There have been three basic positions taken on what is needed in today's office, perhaps broader or at a higher level than you have anticipated. These positions come from basically two sources. One has been looking at administrative support in the industry, what others are doing, and what's being anticipated in the future. The second source which perhaps is more profound in its impact is what is happening in General Mills in the basic area of administrative support. The conclusion is we're probably not that much different than any other company. Currently, in some areas of the company, individual managers have taken initiative and we have backed into enhancements in administrative support by doing some things with word processing. In the broad context, however, we are still mostly working on preparing for change.

Environment

In assessing our motivation for looking at opportunities in the Administrative Support area we have made several observations.

- Sociological--Yes, we should be aware and stay current with developments in the office of the future.
- Technological--Not adequate reason to introduce change in and of itself.
- Organizational--We need a focus to facilitate Cost Awareness, and to develop consistent approaches and visibility to opportunities in Administrative Support Areas.
- Economic--Yes, this is our primary motivation.

Criteria

Given this environment, and having moved through the organization at corporate levels and at group levels to determine or assess receptivity, w

have determined that economics would have to be the motivation to introduce change. Beyond that, change would have to be introduced in a way that would be non-disruptive to current service levels for it to be acceptable. It appears that the most practical approach is to introduce concepts in a way that will prepare us for change. We have determined that:

- First, whatever is done will need to be responsive to cost reduction opportunities.
- Second, we need to be sensitive to human impacts at all levels.
- Third, there are ample cost reduction opportunities.
- Fourth, we will need to be able to clearly differentiate our current approach from past efforts in addressing productivity and demonstrate why this approach will work.

Further criteria has been established that:

- We should be needs responsive.
- Whatever we do should be validated in a pilot.
- It needs to be transferrable to other organizations.

In this context, the Systems Development Organization, my organization, has the initiative to do some study and conduct the pilots.

Approach

One of the key points that we felt would help us prepare for change was just plain awareness. In this context we conducted a specific survey and study. The survey was to look at productivity and ask each individual in our organization to respond to the basic question, "What are the things that are getting in your way of being as productive as you'd like to be?" There were some interesting results which we won't be able to explore here in detail, but fit our overall strategy.

We initiated a very specific study that was performed for us by Dr. Harold Smith from BYU which really was the basis for the pilots. We decided on four basic pilots. The first one was centered on the individual. We asked each individual to develop a plan whereby he/she could be more productive individually and then to follow that plan. As follow-up, this segment was incorporated into our performance evaluation mechanism to stimulate periodic self-evaluation of productivity and performance. The second project was one that dealt with calendaring of meetings. The study indicated in our approach to doing business we are holding a large number of meetings. We validated that the meetings were needed but the time in setting them up was beyond what anyone would anticipate. So we initiated a small automated calendar that will include all of the key people in our organization, allowing meetings to be set up in a few seconds. This fit the criteria and was responsive to a need, could be measured, was cost reductive and transferrable.

The third and fourth pilots are closely related in principle. These were both more specifically aimed at the administrative support area. Our survey showed that our people were involved in administrative type activities about 15-20 percent of their time, and part of those activities were transferrable (someone else could do it for them). So we undertook two pilots: the first, to try to relieve them of some of the administrative tasks that they were doing directly; and the second, to try to make them more effective in doing some of the administrative tasks that they could not transfer.

We feel we have also met the broader criteria of being:

. Responsive to Cost Reduction Opportunities

. Sensitive to human impacts at all levels

. Clearly differentiating our approach from past efforts in addressing productivity and demonstrating how and why it will work.

Conclusions

At General Mills, we have validated the basic position I have expressed today. We have determined that there is a need for preparation for change. First, our approach has been to prepare work in a specific organization with specific criteria and with a pilot approach. We are confident that this approach will accomplish the objective that we're seeking, which is to prepare us in a broader context for the change that is coming in the Administrative Support Areas. We have developed a process for change.

Second, we feel that as we move forward in anticipation of broader implementation that a critical need is going to be for us to solidify our information policy position.

Third, our preassessments and experience to date tell us, in order to manage change successfully we are going to have to strengthen the management of Administrative Support Functions. It needs to be able to:

. Manage the change

. Capture the benefits

. Keep the benefits captured

To relieve them of administrative activities, we picked an organization, Project Management, where there were five Project Managers. We were at a point in time when we needed to fill one of those positions because of a vacancy. We made the decision not to fill it with another Project Manager but to fill it with an administrative support person who would take administrative activity from the four remaining Project Managers, and they, in turn, would pick up the projects of the fifth Project Manager. We are into this pilot four months now and it is working. It looks like a sound concept. We will be looking to other areas where we may apply the same concept.

In the pilot looking to make people more effective in their administrative tasks, it became obvious that the creation of written documents was key. Thus, we had a more specific study done, looking at potential for dictation. We are now in our third month of our dictation pilot. We have essentially asked a control group of some 20 people to dictate everything they create. We are anticipating implementation to the full department (100 people) at the completion of the pilot.

We feel all our pilots have met the criteria of being:

- Needs responsive
- Validated in a pilot
- Measurable
- Transferrable

From a user's viewpoint: what is needed in today's office? For us to even approach the potential in Administrative Support we need to back up and position ourselves to succeed by:

. Preparing for change

. Establishing information policy direction

. Strengthening management of administrative support functions

ROLE OF TELECOMMUNICATIONS IN THE OFFICE OF THE FUTURE

Philip S. Pilibosian
Market Manager
American Telephone and Telegraph Company

I am going to talk about the "Role of Telecommunications in the Office of the Future." In order to better assess that role, I would like to review a popular futuristic view of the office and discuss how that view could evolve. Finally, I would like to put that view into a more realistic perspective as it pertains to telecommunications.

As we look at the office of 1985, we notice several things. Number one, there are no secretaries. You receive services from a pool shared by several managers in your group; we call this pool the Administrative Support Center. These Support Centers are scattered throughout your organization with each one servicing a specific group of people. Within this Administrative Support Center, you have several people: Administrative Support Specialists, Information Storage/Retrieval Specialists, and the Word Processing Specialists. We will define their functions shortly.

Let's take a look at the office as Jim Walker, a typical manager in 1985, sees it when he enters his office at 8:30 on a Monday morning. On his desk is a control panel. Let's take a look at the control panel and functions that it performs. Jim notes that his call-up message light is on. What this means is that somebody has called Jim and left a message on his verbal communication system. Jim listens to the verbal communication system and receives a call from a vendor in the Southwest. Jim had been out of the office and while he was away, a vendor had logged a call on the verbal communication system. Jim then decides that he will take a look at his in-coming correspondence. He presses another button and

his visual display screen will index all the in-coming correspondence by author, title, and date. He notices that there is a piece of correspondence from his boss that references a meeting to he held in a week. He now retrieves that piece of correspondence on his visual display screen. It's a reminder to Jim that he must get a memorandum to his boss today indicating the minutes of the meeting. At this point, Jim calls the Storage/Retrieval Specialist at the Administrative Support Center and asks for a file to be displayed referencing this particular memo and also several other files.

The job of the Administrative or the Storage/ Retrieval Specialist is several-fold. This person codes information for electronic storage, implements the record retention policy, and interacts with the computer to locate and obtain selected information. After Jim has reviewed the correspondence or the files, he dictates his reports into the company dictation system where it is logged in storage. At this point, the Word Processing Specialist will take the information and type the report. The typewriter, of course, is automatic with a video display; and the Word Processing Specialist prepares the day-to-day correspondence. More complex and lengthy documents are sent to the centralized Word Processing Center, which has duplication and in-house printing and publishing capability. When the report has been typed, it is so indicated on Jim's control panel. He now retrieves that memorandum and projects it on his display screen. He now has two methods of making corrections. If there are minor corrections, he can enter it into the control panel. If there are major corrections, he can ask for a hard copy on the printer that sits on his desk, make the corrections, and return it to the word processing center. In this particular case, there were minor corrections and Jim elected to make the corrections himself. When the corrections are made

he transmits the correspondence both to his superior and the file. It is now 11:30 and he has an appointment with his Administrative Support Specialist. The purpose of the Administrative Support Specialist is to review matters requiring Jim to make decisions; one of their primary functions is to assume more management tasks, enabling Jim to concentrate more on planning. The meeting being planned is a two-day conference with other people. In the past this meeting was held every six months. Now, with the video conferencing system, it is held on a quarterly basis.

That's 1985 from the perspective of some futurists. But how did it evolve that way?

One major factor contributing to this evolution is occurring in many of your organizations today or may have in the recent past. That is the implementation of the "state of the art" Division of Work concept in the secretarial environment. Division of work is a two-fold solution to what is perceived to be the problem in the office today which I will discuss momentarily.

First, I'd like to review this Division of Work concept with you. In this environment, secretarial responsibility is removed from the traditional arrangement and is split into two major areas: typing and administrative duties; and telephone, copying, filing, mail handling, etc. On the surface, this approach seems beneficial from a number of standpoints. Typing is centralized and, hopefully, turnaround time is improved, with reduced errors and minimization of peaks and valleys in the typing activity. On the administrative side, one person handles schedules, meeting/travel arrangements, telephone support, copying, special projects, and any other duties that do not require a typewriter. In fact, most of these individuals do not have typewriters. The manager,

now called the principal, becomes the client of this support organization. If this situation were Utopian, the 1985 scenario is believable. However, there are indications throughout industry that the first step in this evolution, the removal of the personal secretary, will make this evolution unacceptable to many. One user gave us examples of the real world after implementation of the "Division of Work" concept.

In the typing environment, the procedures associated with handling a job actually increased turnaround time for typed documents. This production type environment provided little or no employee motivation and resulted in additional errors. The disassociation of the typist from the principal, or originator, resulted in an unfamiliarity with the people in terms of the organization which was being served. This encumbered the typist's ability to produce a document when unable to read the written work, or text, from the originator and when unable to understand the spoken work in the dictation system.

But the greatest injustice was done in the area of the Administrative Specialist. Since a number of principals was not being served by only one individual, this Administrative Specialist was torn in several directions. The principals being served were typically of varying levels. Naturally, the degree of support increased with the level. The Administrative Specialist did not report to any of these individuals, however. Instead, they reported to a separate management organization for evaluation, promotion, and pay purposes. This made it difficult for Administrative Specialists to define priorities. Telephone support became cursory at best, because this individual was no longer intimately familiar with any principal's work activities. The total concept, "Division of Work," in this case, interrupted the smooth flow of information within the user's organization. Although they did realize an

approximate 30 percent reduction in secretaries, the management felt that much was lost in the human factors area. The displacement of the one-to-one relationship in the traditional organization, in their estimation, actually resulted in decreased management efficiency.

This customer, as many of us probably have, concluded that secretarial productivity was the problem in the office.

Productivity, in its broadest sense, is the issue here, but not only the secretary's. According to Stanford Research Institute, office expense has almost doubled in the past ten years and is now in the area of 50 percent of total operating expenses. Manufacturing, during that time frame, realized and 83 percent increased in productivity. In the office, that increase in productivity has been measured at only 4 percent during that ten-year period. We say "measured" because the measurement standard in the office is probably not as well defined as that in the manufacturing environment. But the point is that the impact of automation in the office is minimal by comparison.

If you look at the number of individuals who work in the office, you will begin to understand, if you haven't already, why secretaries are just a part of the picture.

Today there are approximately 41 million "office" workers. Twenty million are principals--executives, functional managers, salesmen, analysts, etc. They are supported by 5 million secretaries, 7 million administrative assistants, and 9 million transaction specialists. Five million secretaries; small when compared to the totality of the population in the office. Those 20 million principals are supported, then, by an equal number of people, and together they represent half of the United States labor force. So clearly we must aim at improving the productivity of all of these individuals. But it is the principal--the

executive, functional manager, etc.--who represent the largest cost element in the office today.

Let's look at the activities that occur in the office today. No matter what your area of responsibility, this is basically what happens. As a principal, your thoughts, words, and ideas are prepared, reproduced, distributed, and stored primarily on the medium of paper. These activities are coordinated by a control element--a human--usually your secretary and the mail clerks. Sometimes that control element is yourself.

By the way, this has not changed much in over the past 100 years. The late 1800's brought the advent of many office tools we know today: the telephone, typewriter, dictation machines, adding machines, punched cards, mimeographs, secretaries. So things haven't changed much in the office in terms of the way in which we utilize and move information. We've been applying individual products to each of these activities for the most part--stand alone products, or solutions.

But the process shown here is more than a collection of disjoined activities. It is the structure of the basic elements contained in the office communications process. In our perception, it is a classic communications problem. If we view this as a communications process and therefore a communications problem, we must focus on a total system solution to address it in the future. For that is what the Bell system has defined as its objective - systems solutions to our customers' total communications needs. Therefore, the scenario drawn at the beginning of this talk may not be totally unrealistic, but may need redefinition.

If we convert the medium from that of paper to one of electrons, things happen in much the same way that they do now. Except that, now, our thoughts, words, and ideas are entered, stored, transmitted, and delivered via the medium of electrons. The control is also electronic,

and provides a means of tying all of these activities together in a system.

This systems approach, however, must consider the user. Future offerings from any vendor must be modular, or flexible enough to allow the user to customize the system to meet and change with their individual needs. More importantly, this systems approach must focus on enhancing the ability of you, the user, or principal or manager, to acquire, utilize, and move information in the day-to-day planning and decision-making process. This, then, is the role of Telecommunications in the Office of the Future.

It is through this improvement that the secretaries, administrative and other support personnel will better serve the organization and thus become more valuable. Of course there will be some reduction in the numbers of people required for support, as happens in any automated environment. But the real improvement must come in your ability to manage your work environment.

Although communications has been our business for a long time, we, the Bell System, and every other vendor in this "Office of the Future" marketplace must answer certain questions if we are to approach the market with intelligent solutions.

Some of those questions are as follows:

What is the potential impact of any offering on the interactions within an organization?

Will it increase the organization's ability to deal with increasingly complex information systems without additional management resource? Will it displace the office as the stationary communications base? By that I mean, will it free you to work from whatever center you choose to work from--your home, another city, name a place.

All of these questions must be answered, but they focus on one thing: the ability of you--professional the manager, executive, etc.--to utilize communications capabilities in the day-to-day work situation, in order to improve your productivity.

The office may be among the "last frontiers" for automation. But is is by no means the least important. In fact, the concept of the "Office of the Future," in our estimation, may have the impact that the telephone did 100 years ago.

Thank you.

THE ROLE OF MICROFILM IN THE OFFICE OF THE FUTURE

Donald W. McArthur, Vice President
Microfilm Products Division
3M Company

In the June 30, 1975, issue of Business Week, an article appeared by Bod Henkel, entitled "The Office of the Future." Since that time, much has been written and many seminars have been given on the subject.

And, the October, 1977, issue of Fortune magazine will carry an article, "The Office of Tomorrow." Now, to all of the thousands of words that have been said, and will be said, on the subject, I'd like to add a few hundred of my own.

Of course, listening to a man make a prediction about the future is a little like trying to tell time with a stopped clock. You know he's going to be right every once in a while, but you don't know when.

One of the big questions raised in the articles and seminars I have mentioned, and certainly the question that I get asked most frequently is this: "Is microfilm going to have a role in the office of the future?"

I know why they ask this question. They look at the steady advance of electronic data processing and wonder if it will make the written word, and therefore microfilm, obsolete.

But whose office are we talking about? I admit that I can imagine an office that has no need for microfilm.

In this ideal, never-never land of an office would be all of the latest electronic devices, all inter-connected with highly sophisticated communications systems. Information could be obtained by anyone, at any time, very rapidly from very large data banks.

This information could be displayed on terminals, messaged by computers, the results verified, and transmitted by the user, again

electronically, to anyone else with a need for it, and the new information stored in the same data bank.

Since the information would never have to be written down, there would be only one application for microfilm in such a system. That one, very important application would be in the office of the maintenance people who would have to keep those enormously complicated machines in good working order.

I, personally, do not think that such an office will come about for many reasons. The most important is this: I can imagine few, if any, users who would gain enough benefit from this kind of a system to justify the cost.

A man does not crack walnuts with a nine-pound sledge. Nor does he plant oak trees in a window box. If he's smart, he uses what he needs and what he can afford.

I believe that the offices of the future will make use of whatever portions of this idealized system that they can afford.

This should leave microfilm a large role to play. I say this because microfilm does some things extremely well, things that will continue to be useful for a long time to come. For example, microfilm can capture information at tremendous speeds.

As you know, before information can be stored in computer-type memory systems, it must first be digitized. To do this, you can either keypunch or electronically scan it.

Either way takes a long time, several minutes to keypunch an 11 inch document, several seconds even with electronic scanners.

Information can be captured on microfilm in just a fraction of a second by a flash of light. Under optimum conditions, on automatic feed machines, thousands of documents per minute can be captured on microfilm.

Secondly, microfilm can store information in an extremely small space, much smaller than with any other medium. One cartridge carousel can store 4 million documents.

With today's normal reductions, you can save at least 95 percent of the space normally occupied by any paper system. By going to higher reductions, you can increase this substantially, but the economics are such that it is not really necessary to do so.

To those who see microfilm as gadgetry and machinery, this area looks both exciting and promising. However, there is a limit beyond which further reduction is more trouble than it is worth. I feel that more important advances will come in other areas, such as retrieval, indexing, and quality of image.

I would hate to see those of us in the microfilm industry put ourselves in the position of the people that made a wire that was so thin it could only be seen with a magnifying glass. They took it to an industrial trade fair, where a Japanese firm asked to borrow it for a short time.

When it was returned, they found that the Japanese had drilled a hole through it.

In other words, gadgetry for its own sake is not only an expensive hobby, it can be embarrassing.

Thirdly, microfilm has proved itself to be easy, both to index and to handle. Certainly, it is easier to handle than the paper that it usually replaces. Microfilm indexing systems, which may appear complex at first glance, have proven themselves to be convenient and simple to use after a brief training period.

In most cases today we are trying to create, by computer, an index that enables the user to find the microfilm image automatically, by

machine, rather than visibly, by hand, or the index might be set up much like a telephone directory. No one complains about how hard they are to use. A keyboard of an automatic retrieval device can retrieve a microfilm image in seconds.

Another thing that microfilm has going for it is its extreme flexibility from a systems standpoint. The reason for this is its variety of formats. I am sure that most of you know what they are: 16 mm roll film, 35 mm roll film, aperture cards, 16 and 35 mm cartridge film, and the various sizes of microfiche.

Many people, I am afraid, have the idea that these formats were created for competitive reasons, but this is not really true. In most cases they were created to meet a particular systems requirement, and to fulfill a specific need in the best possible manner.

Microfilm also offers a number of reduction ratios, which makes it possible to handle documents of various sizes, from large engineering drawings to 3 x 5 signature cards. To do the same job with electronic systems would require either a prohibitive number of scanning devices, or if keypunch operators are used to digitize the documents, far too much time.

In fact, microfilm offers the capability of taking the various size forms and giving them a uniformity that enables electronic scanners to work from a single size in cases where digitalized documents are desired. In other words, even in cases where the systems designers prefer an electronic end product, microfilm can play a vital role in the system.

But perhaps the greatest advantages of microfilm are the several ways in which it saves money. For starters, there is no other medium that even approaches microfilm for the cost of storing information.

According to a recent study, a typical company with 500,000 documents in 20,000 file folders spends $29,000 a year on those files, including the cost of filing cabinets, storage space, and labor to maintain the files. Add to this an annual cost of misfiles of about $45,000, and we are looking at a total annual cost of $74,000.

The operating costs of a new microfilm system, in the first year, would be $18,889.68, with the misfile problem virtually eliminated. And here, I believe, is one of the biggest values of the entire system. No one can really put a cost on misfiled documentation, but we do know that this is probably the most sought after feature in the office of the future.

Another factor is the extremely low cost of duplication. A 100-foot roll of 16 mm film, with 2,300 letters to the roll, can be duplicated at a cost of about $3. A duplicate aperture card might run two or three cents. Microfiche are generally duplicated at less than one-tenth of a cent per image.

And, finally, there is the big advantage of low-cost transmission of large amounts of information from one point to another. Though this is perhaps a minor point in an operation with a single location, it becomes extremely important with multi-national companies, whether they are in insurance, banking, or manufacturing.

They use large amounts of microfilm, sent by mail or messenger to their various branches, for facility drawings, branch bank demand deposit information, and many other kinds of information.

I am going to exaggerate a little bit with a story that will give you some idea of the amount of information that can be sent using microfilm.

Let us consider a Boeing 707 jet freighter as a transmission channel. Assume that we wish to ship extensive data from New York City to Los Angeles. The cargo capacity of a 707 jet is 6,201 cubic feet. Let us load the plane with microfilm on which images have been recorded at a 20 to 1 reduction ratio.

Assume each text page contains 5,000 alpha-numeric characters, then the plane would hold about 5.3×10^{13} bits of information. If we figure an hour for loading and unloading, a cruising speed of from 550 to 600 miles per hour, the data transfer rate is about 2.5 gigabits per second (2.5×10^{9} bits per second).

For a Telepak D channel to carry that much information, it would require about 20 months and cost about $2.7 million. The cost of the 707 would be about $10,000 with a total delivery time of about six hours.

Now that information was put together a while back, when the 707 was one of the bigger planes. Since that time there have been many advances in the electronics field. On the other hand, we now have larger aircraft, such as the 747, and faster ones like the Concorde.

And, of course, there have been many advances in the field of microfilm itself. For instance we are now commonly using much higher reduction ratios that the 20x of the story. The story is, if anything, even more true today.

The savings in postage is more obvious. Those 2,300 letters on a roll of microfilm would cost $299 if mailed separately as paper. The roll can be mailed for 39 cents.

There are, of course, some disadvantages to microfilm. That's not an easy thing for me to say, but it's true. For one thing, you need a device of some kind to read it or to make paper copies from it. This, however, is no different than with electronic technology, which also

requires devices to change the digitized information into human-readable form or make paper copies.

Also, as compared with computer technology, retrieval time for obtaining single images is rather slow, but great strides are being made in this area. When compared with anything other than computer technology, microfilm retrieval time looks very good indeed.

Many people object to the fact that microfilm is non-erasable, making data processing impossible. However, there are cases where non-erasability is actually a plus. It is this very fact that makes microfilm more admissible as evidence in court than computer-generated documents. In fact, computer-generated signatures are not admissible at all.

And, if erasure is impossible, then accidental erasure is impossible. How's that for logic?

Another thing that bothers some people is the apparent high cost of microfilm equipment. I am not sure that this is a legitimate objection. Equipment costs have gone down considerably with the wide acceptance of microfilm systems. Besides, the cost-saving factors that I mentioned earlier insure that the equipment will eventually pay for itself.

It doesn't take that long, either. According to the same study I quoted earlier, the total cost of converting to microfilm, plus operational costs for the first year, would be less than the annual cost of misfiles alone! That means that in its first year of operation, microfilm would save the entire $29,000 of running paper files.

In general, the biggest weakness in the industry has been the lack of good microfilm systems specialists.

For many years the industry has primarily been one built around technical sales people more interested in developing quality images than quality systems, leaving that job up to the customer. However, this is changing.

There is a good reason for this change. So far, I have been talking as if the choice between microfilm and electronic data processing is an either/or proposition. This is no longer true.

With the advent of COM and Microdisc, which is an automatic retrieval system controlled by mini-computers, the two technologies have gone into partnership. Perhaps the greatest dividend has been the influx of the kind of superior systems talent needed to support these kinds of machines.

I have also, so far, been talking about using microfilm as it now exists and taking advantage of its many features in designing systems for the so-called office of the future.

But I think we can expect to see some innovations in microfilm systems as well as in the electronics or automation side of the office.

For example, I have seen some beautiful work being done with holography in microfilm, where images are stacked on top of each other in the emulsion of the film, as well as being reduced as they are today. For example, a 4 x 4 inch photosensitive piece of glass can store the same amount of information as the first 500 pages of the St. Paul, Minnesota, Telephone Directory. This type of technology could lead to systems with extremely fast access time, and incidentally cut down on needed storage space.

Also, we are seeing systems come to the marketplace that use updatable microfilm. By that I mean you can add images to existing microfiche, for example, or alter the actual images that are on that microfiche.

These systems, too, will be improved substantially in the near future, giving us a whole new way of approaching our filing problems. New techniques are being developed to scan microfilm images at fantastic speeds, digitize the information, and feed it into the memory of a huge computer. In fact, the Census Bureau will use these systems in 1980.

In closing, let me say that even though all the excitement in regard to the office of the future seems to be centered around devices, such as word processors, facsimile machines, telecommunications machines, and mini-computers, I am confident that microfilm will play a major role in that office.

In fact, I personally believe that the biggest changes in the office of the future will probably come more in the way they are organized to handle information, rather than in technologies alone. Where today we have many specialists, such as data processing managers, reproduction managers, office managers, filing supervisors, records managers, and the like--each running his own department with very little inter-relationship--I believe the future offices will be headed up by someone with the title of Data Resources Manager, who will be responsible for all data and systems with the specialists reporting to him; but regardless of it or how soon this may happen, my original statement still stands. Microfilm systems will play a major role in all phases of the office of the future.

THE ROLE OF COMPUTERIZED WORD PROCESSING AND INFORMATION MANAGEMENT IN THE OFFICE OF THE FUTURE

James L. Ward
District Marketing Manager
IBM Office Systems

Most people, in trying to forecast, project the future as a straightline continuation of the past. This is true, not only of economic and product forecasts, but of most expectations we have in day-to-day living. If price or product sales have been growing rapidly, increasing at an increasing rate, we tend to project continued rapid increases. If we are having a 10 percent growth from year to year, then we project the future as a continuing 10 percent growth. Similarly, if things have been static and the curve is flat, we project it to stay so. This forecasting technique is generally accurate, especially in the short term. The key to forecasting is to know when the "kink" in the curve occurs, when there is a step function, when the future is radically different from the past.

In the world of the office, our business, there have been two major step functions when things have changed radically. The first occurred about one hundred years ago in the last quarter of the 19th century. After all, it was just one hundred years ago in 1876 at the Philadelphia Centennial Exhibition that Alexander Graham Bell demonstrated his invention of the telephone. It was in 1877 that Thomas Edison invented the dictating machine. It was as a result of the census of 1880 and the length of time that it took to tabulate the results that Herman Hollerith invented punch card tabulating equipment, which became the forerunner of our entire computer industry. The typewriter was invented by Sholes

about 1868. In fact, most of the basic office equipment that we are familiar with today was invented and first marketed before the turn of the twentieth century.

The first copying equipment, which I think of as the A. B. Dick Mimeograph, and the first recording adding machine, invented by William S. Burroughs, came on the market before 1900. Within a very short time after their invention, office machines were adapted to electric motors, and it can be truly said that electricity was the technological "change agent." The introduction of electricity to the office was the first major change in patterns of business communication and administrative work since the Middle Ages.

The second major change came after the second World War with the introduction of magnetics. Magnetic recording had been invented in 1898 by Vladimar Paulsen. There were, however, no commercially available magnetic machines until after the second World War. In fact, the first magnetic recording machine commercially marketed was a Pierce wire recorder. It was sold in Macy's Department Store in August of 1945. The use of magnetic recording equipment not only affected dictating equipment, but magnetic tapes and drums changed the computer technology from punch card electro-mechanical equipment to today's magnetic recording floppy disks and direct access storage devices. Magnetic tapes and cards are now available in Word Processing automated typewriters.

The magnetic technology obviously had been around; but until it could be economically utilized in office equipment, it was not really a "change agent." Thus, technology by itself is not the key, but technology combined with economic justification.

The next major technological change that seems to be able to impact the office is that of satellite communications. The concept of the satellite being able to relay microwave electronic transmissions from one point on earth to another with the speed of light offers a great opportunity to reduce the cost of communications. In the office, the main purpose of typing is to communicate information to somebody else.

Very rarely do we type "just for the file." With low cost, electronic communication by satellite, the possibilities and potentialities of "electronic document distribution" (electronic mail) open up for office communications.

Satellites can reduce the cost of communications by a factor of about 10. This is because the largest investment of the telephone companies is in the copper wire and microwave towers that criss cross the country. With satellites, a multi-location organization can put up a relatively small antenna, with either a 16' or 23' "dish," on the roof of their buildings or factories. The satellite is "geo-stationary." That is, it spins around the earth at the same rate of speed that the earth turns. Thus, it appears to the observer, as well as to the antenna, as being fixed in space. It acts as an electronic mirror. It operates as a relay station and retransmits the signals it receives. One satellite covers about a third of the globe. A satellite hovering off the coast of Mexico can communicate with antennas located in the United States, Alaska, and Hawaii.

Satellites are built to handle a tremendous amount of communications at one time. When we think of communications, we think of the Communicating Mag Card "Selectric" Typewriter at 135 bits per second.

Or, we think of the new 46/40 Document Printer, which is able to communicate at 2,400 bits per second.

High speed data processing terminals, like the 3270 display terminals, communicate up to the rate of 9,600 bits per second. In comparison, the satellites operate in the Gigahertz range. They can handle millions of bits per second, which means they can handle thousands of Word Processing and data processing type channels simultaneously.

Satellites were originally designed for television communications. Think of a television signal. You see a picture about 30 times a second in order to get the illusion of motion, and that would be the equivalent of 30 pages. But, you see it in three colors. Hence, the amount of information needed to communicate one television signal, when converted into the amount of information needed for typed documents, is so great that when the communication channel is divided into appropriate size paths, the cost for each path is relatively low.

The other point is that the satellite is hovering some 22,500 miles above the earth. Since communication goes at the speed of light, varying distance between any two points on the earth that are communicating does not increase the cost.

As firms and organizations see that the cost of communications is coming down rapidly, they will be forced to investigate electronic document distribution as a viable alternative to their present systems.

Because it isn't a cost factor difference of 10 percent or 20 percent, but perhaps 1,000 percent, no organization will be able to ignore this technological "change agent." The major competition, after

all, is physically handling all the paper, and realistically, we don't see the "mail room" being able to change dynamically enough to utilize this new technology.

One of the major reasons that companies will be interested in setting up satellite communication links is because they see the costs of their data communications are rising. This is due to the emphasis in the data processing industry on large data-based/data communication systems (DB/DC).

Organizations are now being sold by IBM and others on the value of having a large computer with centralized data files and setting up terminals at all of the other locations in the organization. Companies are adapting to this system because of the efficiency of the large data-based/data communication systems. As they communicate with terminals throughout their organization, their costs of communications go up rapidly, and hence, the interest in satellite communications at a significantly lower cost than present techniques.

Satellites are flying today. RCA SATCOM has two satellites orbiting now. Western Union has two WESTARS. IBM has applied to become a one-third partner in Satellite Business Systems (SBS) in conjunction with Aetna Insurance Company and COMSTAT.

AT&T and GT&E are partners in satellite systems, but at this point in time, the Federal Communication Commission is limiting AT&T and GT&T to voice telephone traffic in order to expand the industry. The FCC wants competition with many different vendors.

The Satellite Business Systems has filed to loft two satellites by 1979 and to be able to sell services to customers using a 16' or 23' "dish" antenna. There is obviously a need for local connection to

telephone company lines for local links. World-wide transmission will be in conjunction with Intelstat (the international satellite system). The opportunities and economies of world-wide telecommunications will be the major change agent for the future.

An IBM mag card holds 5,000 characters. If each character was coded by an 8-bit byte, then one mag card could hold 40,000 bits, which is a little more than a second of digitized voice recording.

From a transmission point of view, digitized voice is a reality, but digitized voice recording is dependent upon low cost mass storage devices, like "bubble" memory. Magnetic bubbles are a form of memory where it's contemplated that perhaps up to a billion bits of information could be stored in a device about the size of a pack of cigarettes. Several months ago The New York Times column on inventions cited that three IBM engineers had received a patent for a bubble memory device that might in the future be used for Word Processing equipment.

Satellites, of course, use digitized electronic communications as do microwave transmission systems. The telephone company recently installed a cable in one of the automobile tunnels under the Hudson River. One cable can handle up to 40,000 normal telephone conversations by using such digitized transmission techniques.

Another advantage of the digitized system is that it eliminates the need for modems (modulator-demodulator), which are necessary when people want to communicate digitized information through the public switched network. It is necessary to convert the electronic digitized information for data processing or Word Processing to an analogue signal so it can be transmitted as the voice signal is transmitted. It then has to be demodulated at the other end and put back into a digitized form for

the office equipment. These devices add expense to a customer's network of communictions. The telephone companies are gradually putting digital systems in place, but it will take a long time before their entire network is converted. A digitized telephone system complements the data communications and electronic document distribution techniques which are rapidly growing.

Organizations that wish to take advantage of electronic document distribution really have only two alternatives. One, they can "code" their typing work; that is, digitize it by typing onto an electronic device, like an IBM mag card typewriter. This codes each of the characters and control signals into a digitized format which can be most easily and economically communicated along the new digital facilities like satellites. The alternative is to go to a facsimile system. Facsimile is used widely today. There are over 80,000 machines installed in offices, plants, and warehouses.

Facsimile is limited. First of all, in transmitting a facsimile, you are mostly transmitting white space. Look at a page of typed information. The page is not packed with information. A facsimile machine, whether it communicates four minutes, two minutes, or thirty seconds a page, communicates the page at the same speed whether there is one line of typing or the page is chock full. The second limitation with facsimile is that once it is transmitted there is nothing that the recipient can do but read the document. By using a mag card or floppy disk device, like the new IBM 46/40 Document Printer, transmission speed is totally utilized. Only the digits representing the characters and control keys themselves are transmitted. Thus at the receiving end, the information can be magnetically encoded as well as printed out for subsequent revisions, changes, and additional printouts.

The third disadvantage of facsimile systems is quality of print. Anybody who has seen a facsimile document realizes that the quality of print is nowhere as good as an original typed document. The new Word Processing machines that communicate provide a "typewritten" level of quality which is not only highly readable, but most accepted in business communications. The importance of quality print is underscored by the fact that many organizations do not make maximum use of electronic document distribution they have installed today.

There are internal Telex and TWX systems in most large organizations. IBM has its own, ITPS (Internal Teleprocessing System) on the Corporate Consolidated Data Network (CCDN).

In comparison to facsimile, the communication of coded information for electronic mail offers the advantage of reduced communication costs. With magnetic keyboards, only the information is transmitted. In addition, magnetic media is provided for subsequent revisions, and the final printout has better quality for readability.

My expectation is, in order to take advantage of coded electronic document distribution, organizations are going to have to move from typewritten to magnetic keyboarded documentation. This is the key as we see the trend to the office of the future. All large organizations and most small and medium-sized enterprises are aware of Word Processing. They are aware of the efficiencies of dictation equipment and magnetic keyboarding, the ability to handle revisions, eliminate extra proofreading, and provide the fastest possible typing speed of the secretary. Many accounts that have implemented Word Processing Systems have not expanded the system throughout their organization. Many accounts have installed just one or two keyboards, but have not implemented a system at this time.

Therefore, the efficiencies and economies of magnetic keyboarding apparently are not great enough for most organizations to change their traditional secretarial organization and patterns of office work. Perhaps the additional economies of electronic document distribution will be the catalyst that causes many additional departments within enterprises, as well as many other organizations, to change from typewriters to magnetic keyboarding and the efficiencies of Word Processing.

Still another "change agent" will be the use of stored program "logical" machines for the administrative aspects of Word Processing. We must always keep in mind that less than one-third of the traditional secretary's time is spent typing and transcribing. Two-thirds of the time is spent on administrative work, such as telephone answering, setting up meetings and conferences, filing, making copies, abstracting and preparing work for others to dictate, and a myriad of other tasks all classified in the area of "nontyping" or "administration." Originally, Word Processing Systems addressed only the typing side of the job by specializing a group of secretaries in a typing area, known as the Word Processing Center. The grouping, the specialization, and the utilization of the most advance equipment resulted in significant savings to the organization. While the secretaries who do the balance of administrative work could be grouped or not, specialized or not, there was no "equipment" made to provide significant increases in productivity.

Under the assumptions that I've already made, that electronic document distribution and multi-functional terminals will indeed be part of "The Office of the Tomorrow," then a third prediction can be made: that the devices will be "mini-computers" of various types. That is, it will have "intelligence" through the use of a stored program. It will

be able to be programmed to make "logical" decisions. These devices, therefore, will have the power to address and improve the administrative aspects of Word Processing.

This power can be used in many different ways, depending first upon the needs of the organization; second on the programming capability of the devices. For example, secretarial scheduling of meetings and conferences chews up a great deal of time. If a meeting has to be arranged between eight principals, it may take twenty or thirty phone calls before the meeting is firmly set up. On the other hand, a multifunctional terminal with stored program logic could be keyed to record into memory the "calendar" of all the principals in the office. Today the secretary in setting up a meeting may find that seven people can make a given time and date, but the eight person can't. She has to reschedule the meeting and recall everybody to confirm. Most secretaries and principals are familiar with the telephone roulette that goes on in setting up meetings.

A second example of administrative support is the ability of a computer-based system to cut down on a number of telephone messages and callbacks. IBM System/7 computers are already installed in several IBM locations as part of a telephone backup system. In most offices today when a principal's secretary is not available, someone nearby picks up the call if the principal cannot do so. This "nearby" individual cannot do a very good job answering the caller's questions, such as: "Where is the principal, when is he back in, where can I reach him now, who can I talk to in his place, when will he call me back?"

With a telephone backup system, a dedicated message center operator intercepts the call.

This message center operator is really in no better position to answer the caller's questions; except with the computer-based system, the message center operator keys into the system the telephone number of the "called" party. This flashes up on a screen: the name of the party, their calendar, who they work for, who works for them and other pertinent information. In this way, the message center operator can more efficiently handle the call. In many cases, this saves a "callback" by the principal and results in better service for all the secretaries as well as the "calling" parties. With this information in the computer-based system, "intelligence" is available to do other scheduling and coordinating tasks, as needed.

Given electronic document distribution, multi-function terminals, and programs to support the administrative aspects of Word Processing--What else is expected of "The Office of Tomorrow?" A greater use of "Office Landscaping." Growth of microfilm and microfile to cut down on the volume of paper filed. Expanded job opportunities and management positions for women. All in all, a very bright outlook for people, new technology, and innovative management.

THE OFFICE OF THE FUTURE--AN INTEGRATED SYSTEM?

Lawrence R. Rojahn
Senior Industrial Economist
SRI International*

The emergence and continued development of solid state electronic technology over the past 30 years has resulted in the continuing emergence of a series of products and systems having direct application to the general office environment. These include, but are certainly not limited to, those indicated in Table 1.

Numerous observers of these phenomena have been led to speculate that these developments, based in hardware technology, are precursors of the "Office of the Future." While this may in fact be the case, I think it behooves one to be extremely careful concerning prognostications of this sort, particularly if one is concerned with what is real, practical, and possible over the near term (the next 5 to 10 years) as opposed to long-term possibilities. In my view, we are moving along an evolutionary path, from what exists today--the modern office--toward the automated office, and eventually, perhaps in a generation or two, arriving at the Office of the Future.

What is the Office of the Future?

In the fullest sense, the term "Office of the Future" implies a work environment that exists when man's need for communication, processing, storage and retrieval of information can be met comfortably and easily through utilization of electronic systems. In short, it ultimately means nothing less than the virtual disappearance of pencil

* While this text forms the basis of Mr. Rojahn's oral remarks, it should be used with the understanding that parts of it may have been omitted in the oral presentation and by the same token, other remarks may have been made orally which do not appear in the text.

Table 1

SOME ELECTRICAL AND ELECTRONIC DEVICES
PRESENTLY FOUND IN THE OFFICE ENVIRONMENT

Videophones	Dictating Equipment
Computer Terminals	Microfilm/Microfiche Information
Word Processing Systems	Storage & Retrieval Systems
Electronic Calculators	Automatic Dialing Devices
Facsimile Machines	Hands-free Telephones
Teleprinters	Teleconferencing Equipment
Automatic Answering/Recording Devices	Copying Machines

and paper from our working environment. This concept, however, presents us with certain problems that fall beyond the bounds of those usually associated with the application of electronic systems.

For example, one must realize that the Office of the Future may not have a separate existence as a physical place as it does at the present time. Secondly, it is not at all clear that the present pyramidical-hierarchical organization form commonly found in private enterprise, government and other entities, will in fact survive.

How do these thoughts fit with the preceding discussions and some of the commonly held notions concerning the Office of the Future? The answer is simple. We are continuing upon an evolutionary course. The foreseeable end result is the Office of the Future. However, we cannot be certain, but can only speculate, about the nature of the result.

There are too many alternative forms in which Office of the Future concepts might ultimately be deployed. One thing, however, appears virtually certain. The development and widespread usage of automated office systems is a necessary precursor to the further evolution of the office environment.

Why Are We Concerned About the Office of the Future?

After decades of apparent unconcern, the office work environment is receiving considerable attention. Why now?

Traditional wisdom tends to cite high administrative costs, low productivity, and the like as the prime motivating factor and additionally note that the advances in electronic technology now make it feasible for us to realistically consider office automation. I submit there is an even more fundamental cause, and that is that we have no other choice. According to Dr. Marc Porat,[1] approximately half of Gross National Product is derived from the production, processing, and distribution of information, goods and services and almost half of the work force is engaged in these activities. In 1940, only about 25 percent of the work force was so engaged.

If we are to continue to sustain a meaningful rate of real economic growth, significant productivity gains in the information sector will be necessary. The office environment, as the prime focal point for information related activities, must undergo change.

What is an Integrated System?

In the context of automated office systems, the term 'Integrated System' tends to have a number of meanings. Personally, I prefer a broad definition: An integrated office system exists when users can work with the system easily and comfortably, utilizing its capabilities to achieve whatever purposes they desire. In this sense, system integration in the automated office is not achieved until human factors problems are considered and resolved. Merely converting all information to electronic form and, in some fashion or other, combining and interconnecting the devices and equipments listed in Table 1 will not

produce an Integrated System. It may be integrated from an engineer's standpoint but is very likely, from the viewpoint of those who utilize the system, to appear to be a bit of a nightmare.

Technology

Technology is a key concern when addressing the Office of the Future concept. It will be the continuing evolution of our electronic technologies that provide the fundamental resource enabling us to develop the Office of the Future. In the nineteenth century, the invention of the telegraph, the telephone, and the typewriter had a profound effect upon the nature and scope of business and governmental organizations, ultimately resulting in the creation of the office as we know it today.

At the present time, we already have the fundamental hardware technologies necessary for the Office of the Future. Our problem is application of those technologies. In other words, it is software (in its very broadest sense) rather than hardware that is of most significant concern. Hardware development will take care of itself. When one considers them as yet unrealized capabilities of stored program controlled communications systems as exemplified by AT&T's Dimension PBX and the possibilities inherent in personal computing systems, such as the IBM 5100, one readily realizes that we have a wealth of hardware available to us.

During the next 10 to 15 years, this wealth of hardware will continue to expand. It is not all out of the question that, within the next 10 years, we will see, for example, the introduction of the voice-writer--that is, a voice-driven typewriter or CRT--on a commercial basis.

With regard to another aspect of hardware technology, that of cost, the outlook, is also reasonably bright. That is not to say unit costs of commercial equipment will drop substantially, but rather that there will be substantial enhancements in capability with little change in price. We are tending to approach a point where the cost of a product primarily reflects the cost of packaging, assembly labor, selling and administrative expense, transportation, and the like.

Having dismissed in a rather light-hearted manner some serious hardware technology and economic questions about automated office systems, I will now discuss some of the more serious Office of the Future questions.

Human Factors

In most existing writings on the subject of automated office systems--and particularly word processing systems--much tends to be made of the fact that a significant portion of secretarial worktime is taken up with errands or other trivia, resulting in some degree of organizational inefficiency. No doubt, this is true and, no doubt, improvements can be made, but care must be exercised when work assignments are restructured.

On some occasions, application of word processing systems has resulted in organizational structures in which document preparation tasks are performed by some centralized pool of highly trained word processing typists and in which most other secretarial tasks are assigned to an administrative support person.

Whether this approach is more or less efficient, I leave in the hands of the efficiency experts who delight in such measurements. For

this scenario, however, one thing seems to be eminently clear. What has been accomplished is the elimination of some number of moderately interesting jobs (secretaries) and the creation of a smaller number of more interesting jobs (administrative support persons) and a substantial number of less interesting jobs (word processing typists). By less interesting, I mean probably more boring and drudgery-like.

The extent to which such an approach can be implemented on a wide-spread basis throughout business and government organizations is questionable. Employee positions and job functions presently categorized as secretarial or clerical in nature comprise a broad range of job responsibilities and required skill levels. If wide-spread implementation of automated office concepts result in any substantial mismatch with the skills and expectations of the workforce, substantial sociological problems may result. I suppose, in the final analysis, employees can be given an ultimatum of "do it or else," but that, frankly, is not a highly satisfying answer. I firmly believe that office automation approaches that do not entail substantial alteration of job functions and organizational structure will have the highest probability of near-term acceptance.

There is a major problem with respect to the development of interpersonal communications systems that results from the disparity between hardware technology advances and the degree to which those advances are accepted by humans. Several years ago, Mr. H. Wallace Siniako of the Smithsonian Institution enunciated the "Universal Garage Principle."[2] His principle suggests that the major barriers to the introduction and acceptance of new systems are primarily social and human rather than technical or hardware related. In organizations, high

status individuals--those running the show--expect the organization to adapt the change to accommodate themselves. They are certainly not prepared to do the reverse. Another aspect of this problem is related to age and experience. Older, more senior, individuals do not like to be trained in new ways. They resist adopting new operating modes as the ones which they have developed over years have proven to be successful for them. These very human characteristics then suggest that automated office systems concepts will be implemented within the lower levels of existing organizational structures and that the process will initially involve younger and less experienced individuals, as they appear to be more capable or willing to adapt to changed circumstances.

Another human factor problem stems from the likelihood that evolution toward the Office of the Future will entail considerable change and alteration of existing organizational structures and decision-making processes. High status individuals may very well feel threatened by Office of the Future concepts if they perceive that implementation of these concepts may result in a lessening of their power and authority.

Indexing

The problem of indexing is another of the significant areas requiring additional research. First, if Office of the Future concepts are to be successful through substantially improving office efficiency, a comprehensive indexing system will be required. This is not a trivial problem.

For example, consider the individual in a company who is assigned a specific telephone number. Typically, these individuals tend to be shifted to different physical locations from time-to-time; and it

would be desirable for administrative purposes to allow the intra-building communications system to be self-adjusting to such moves. In other words, when a person moves from one office to another, he still retains the same telephone number. Several PBX systems that provide this feature are now available.

However, upon further consideration, one realizes that an individual in an organization has more than one identity. He is, of course, himself, but at the same time, he also occupies some functional position--say, Director of Marketing. When the individual changes location and function, does the telephone number stay with the person, or with the position. Similar problems arise frequently in the business environment. If we are to convert and distribute all business information in an electronic form, these problems must be addressed.

The same type of problem arises in a more serious form when one considers the organization of files. Should electronic files be centralized or distributed? To what extent should multiple copies be permitted? Who should be permitted to access files? Under what conditions and to which files? How will these files be effectively indexed, controlled, and updated?

By observing today's office environment, one finds that almost no organization of any size has a consistent cross-indexed filing system, consistently applied. In many cases, filed information is ultimately located only because the individuals who originally filed it was available to process the request. Electronic systems may improve the operating efficiency of organizations in this regard, but in the near-term, this will largely be a result of the application of brute force techniques, rather than any significant fundamental improvement based upon a greater understanding of the problem.

Privacy

Another significant question that must be addressed when implementing Office of the Future systems is that of individual privacy. As we approach the point when all information is committed to electronic memory banks, a serious danger arises concerning access to that information. What psychological problems result when you know that your superior may be able to acces your private notes at will--or for that matter, your peers or subordinates?

I sincerely hope that organizations implementing Office of the Future concepts avoid some of the mistakes that were made in connection with some of the earlier management information systems. There was one system designed in which a superior would receive computer-generated reports concerning a subordinate's area of responsibility at the same time the subordinate received the reports. This produced a very unpleasant situation in which the subordinate was being called upon the carpet by a superior to answer for situations neither one knew existed prior to generation of the reports. The potential for similar mischief occurring with automated office systems is extremely high.

Economic Justification

Another problem that continues to plague this field is that of economic justification. First, it does not appear that piecemeal studies, such as those that address the application of word processing in limited situations, are of any great value. The choice of assumptions utilized for such studies tends to pre-ordain the results. Whether or not the results bear any relationship to fact is often questionable.

The organization with which I am associated, SRI International, is one of the leading research institutions in the world. At the same time, it is perhaps one of the best examples of an organization wedded to traditional modes of thinking when it comes to considering application of Office of the Future concepts internally. In most parts of the organization, word processing is virtually unknown, and our internal communication system is archaic. Why does this state of affairs exist? I personally suspect the main culprit to be the accounting system. The ways in which organizations keep their books can have a profound influence upon the decision-making process--an influence which is not always altogether beneficial.

When it comes to planning and justifying the application of automated office systems, there appears to be too great a tendency to adopt narrow perspectives and limited horizons. For an organization to receive the full range of benefits from automated office systems, those systems must be considered in a total organizational context. During the transition period, it is probably that diseconomies and inefficiencies will occur.

Summary

I personally believe that the Office of the Future is a concept worth striving toward. I can only hope, however, that its eventual implementation will have a humanistic flavor rather than a mechanistic one. Considerable effort remains if we are to create an environment in which the machines function to serve the people rather than the people serving the machines.

Footnotes

1/ Marc U. Porat, The Information Economy (August 1976), Institute for Communication Research, Stanford University (unpublished doctoral dissertation).

2/ H. Wallace Sinaiko, Smithsonian Institution, "The Universal Garage Principal: Designing for Acceptance," Institute of Electrical and Electronics Engineers, National Telecommunications Conference Record, December 1974.

OFFICE OF THE FUTURE: CRITICAL COMPETENCIES

William H. Baker
Harold T. Smith
Max L. Waters

The Forum this year focused on emerging office needs. Specifically attention was directed to three areas: (1) current trends which will affect the office of the future; (2) current office problems and how business and education can become change agents in structuring new office environments, and (3) what business and education must do to coordinate the development of the office of the future.

After the Forum participants presented their position papers, time was devoted to discussion and questions. Guests first quizzed one another to clarify significant issues and to assure that the focus was on real problems. Then members of the gallery had opportunity to question the businessmen.

The final session was spent in developing a list of competencies which workers and managers of the office of the future must possess. Following are the lists developed by the Forum participants.

Critical Competencies for Managers

A. Communication

1. Active listening
2. Non-Verbal communication
3. Obtain and provide feedback
4. Write effectively
5. Oral skills
6. Applied psychology
7. Speed reading

B. Technical Knowledge

1. Current state of the art (What equipment can and cannot do)
2. Current trend awareness
3. Technological terminology
4. Basic typing skills

C. Administrative Ability

1. Human relations
2. Group and team decision making
3. Analytical skills (Quantitative and general problem solving abilities)
4. Implementation (Make it happen)
5. Time management
6. Planning and direction setting
7. Goal setting

D. Management Development

1. Self development
2. Motivation
3. Art of interviewing
4. Ability to identify strengths and weaknesses in people
5. Preparation of development plans
6. Ability to write performance objectives
7. Ability to motivate
8. Ability to move on employees with marginal performance
9. Ability to promote and fire people

E. Marketing Skills

1. Focus drive for results
2. Ability to execute selling techniques

3. Telephone power

4. Ability to satisfy customers

5. Positive mental attitude

Critical Competencies for Office Workers

A. Interpersonal Relations

1. Ability to work well with people

2. Ability to influence people to achieve goals and to exercise leadership

B. Communication

1. Ability to achieve mutual understanding in two-way communication situations--oral and written

2. Ability to think clearly and precisely

C. Goal Setting

1. Ability to set meaningful and realistic personal and organizational goals

D. Time Management

1. Ability to organize one's time to achieve important goals

2. Ability to set and follow priorities

3. Ability to adjust priorities according to changing needs

E. Motivation

1. Ability to motivate one's self and to assist others in achieving motivation so that all persons are self-generated in accomplishing results

F. Decision making

1. Ability to think and to select most appropriate course of action from several alternatives

G. Self-Development Techniques

1. Ability to continue to learn and develop, particularly on an individual basis

H. Problem Identification and Solution

1. Ability to filter out symptoms to identify real problems and to develop workable solutions

Note: For copies of the series of four articles by Dr. Harold T. Smith on the office of the future, send $1 to:

Administrative Management Society
Maryland Road
Willow Grove, PA 19090